Electronics Engineering

Sr. No.	Course Code	Courses	L	T	P	Credits
1	EC3CO02	Linear Integrated Circuit & Applications	3	0	0	3
2	EC3CO04	Analog Communication	3	1	2	5
3	EC3CO06	Digital Signal Processing	3	1	2	5
4	EC3CO08	Engineering Electromagnetic	4	0	0	4
5	EC3CO10	Microprocessors & Microcontrollers	3	0	2	4
6	EN3MC04	Human Values & Ethics	2	0	0	0
7	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
		Total	**21**	**3**	**6**	24
		Total Contact Hours	**30**			

Electronics & Instrumentation Engineering

Sr. No.	Course Code	Courses	L	T	P	Credits
1	EI3CO02	Linear Integrated Circuit & Applications	3	0	0	3
2	EI3CO04	Communication System	4	0	0	4
3	EI3CO06	Digital Signal Processing	3	1	2	5
4	EI3CO08	Electronics Measurement and Instrumentation	3	1	2	5
5	EI3CO10	Microprocessors & Microcontrollers	3	0	2	4
6	EI3MC04	Human Values & Ethics	3	0	0	0
7	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
			21	**3**	**6**	24
		Total Contact Hours	30			

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO02/EI3CO02	Linear Integrated Circuit & Applications	3	0	0	3

Unit I-Introduction

Introduction to integrated circuits: Advantages of IC's, basic building components.

Operational Amplifier: Introduction of OP-AMP, Block diagram, characteristics and equivalent circuits of an ideal OP-AMP, Power supply configurations for OP-AMP.

Differential amplifier and analysis: Configurations- Dual input balanced output differential amplifier, Dual input unbalanced output differential amplifier, single input balanced output differential amplifier, single input unbalanced output differential amplifier, Common-Mode Rejection Ratio (CMRR), Current Follower, Voltage Follower.

Characteristics of OP-AMP: Ideal and Practical, input offset voltage, offset current, input bias current, Output offset voltage, Compensation circuits for offset reduction, thermal drift, Effect of variation in power supply voltage, slew rate and its effect, Power Supply Rejection Ratio (PSRR) and gain bandwidth product, frequency limitations and compensations, transient response.

Unit-II OP-AMP Amplifiers and Wave Shaping

OP-AMP applications: Inverting and non-inverting amplifier configurations, summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier.

Generator and Wave Shaping: Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, Voltage Controlled Oscillator, Comparator, Zero Crossing Detector.

Unit-III OP-AMP Filters

Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter, all pass filters, self-tuned filters, AGC and AVC using op-AMP.

Unit-IV Timer

IC-555 Timer concept, Block pin configuration of timer. Mono-stable, Bi-stable and A-stable Multi-vibrator using timer 555-IC,Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

Unit-V Regulators

Voltage Regulator using OP-AMP, Fixed and Adjustable Voltage Regulators. Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs (LM317, LM78XX and LM79XX). Type of regulator: Series and Shunt, Line and Load Control, Regulated and Unregulated power supply, Switch Mode Power Supply (SMPS)

Text Books:

1. Ramakant A. Gaikwad, OP- Amp and linear Integrated circuits, Pearson.
2. B. Visvesvara Rao Linear Integrated Circuits Pearson.
3. D. Roy Choudhury, Linear Integrated Circuits, New Age Publication.

References:

1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press
2. J. Millman and C. Halkias: Integrated electronics, TMH.
3. A. Sedra and K. Smith: Microelectronics, Oxford Press.

Web Sources:

1. http://www.nptelvideos.in/2012/11/analog-ics.html

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EC3CO04	Analog Communication	3	1	2	5

Unit-I: Amplitude Modulation: Block Diagram of Communication system, Need of Modulation, Type of Modulation, Amplitude Modulation and spectral interpretation, BW, Power requirement and Efficiency. Study of AM suppressed carrier (DSB-SC, SSB-SC, VSB-SC), BW & power requirement, Efficiency, Generation & detection methods of AM, synchronous detection & carrier acquisition.

Unit-II : Angle Modulation system:- Types of Angle Modulation, NBFM, WBFM, frequency domain representation, , BW, Power requirement and efficiency, generation of FM (Direct & Indirect method), Detection of FM by various methods (frequency discriminators & phase discriminators, PLL). Advantages of FM over AM.

Unit-III : AM & FM transmitter, Receiver:- Low & high level AM transmitters, features of a receiver, TRF receiver, Super heterodyne Receiver, Image frequency rejection, FM transmitter and receiver, pre-emphasis and de-emphasis, AGC, AVC, AFC.

Unit-IV: Noise: - Correlation, Energy Spectral Density & Power Spectral Density. Noise classification, Sources of noise, Noise Figure, Noise temperature, Noise Bandwidth, Figure of Merit, Narrow Band Noise, Figure of Merit for various AM & FM, and effect of noise on AM & FM receivers.

Unit V : Sampling, Pulse Modulation:- Types of Pulse modulation (PAM, PWM, PPM) : their generation & Detection.

Text Books:

1. Simon Haykins, Communication System, John Willy
2. H. Taub & D. Schilling, Principles of Communication Systems, TMH.
3. R. P. Singh & S.D. Sapre, Communication System, TMH

Reference Books

1. B.P.Lathi, Modern Digital & Analog Communication System, TMH
2. J.G. Proakis, M. Salehi, Fundamentals of Communication Systems, Pearson Edu.
3. A. B. Carlson, Communication System, Mc-Graw Hill

Web Source

1. https://onlinecourses.nptel.ac.in/noc17_ec11
   www.nptelvideos.in/2012/11/communication-engineering.htm

List of Practicals

1. Study of front panel of Digital Storage Oscilloscope (DSO) and function generator.
2. Generate DSB-FC (AM), DSB-SC and SSB signals. Calculate the modulation index by using formula and trapezoidal pattern for DSB-FC and DSB-SC.
3. Demodulation of DSB-FC using Envelope detector.
4. Perform experiment based on AM transmitter and receiver, and study the Superheterodyne Receiver.
5. Modulate and demodulate FM signal. Calculate the frequency deviation and modulation index.
6. To understand the principle of pre-emphasis and de-emphasis circuits and measure the operating characteristics of pre-emphasis and de-emphasis circuits through the experiment.
7. Study of Frequency Division Multiplexing/De-multiplexing with sinusoidal inputs / audio inputs.
8. Analyze the spectrum of AM, SSB and NBFM modulation using TINA PRO.
9. Study of spectrum analyzer and observe the spectrum of sine waveform and modulated AM and FM wave.
10. To examine the operation of Noise generator, Signal Attenuator, Square wave distortion and measure the output power, frequency response of sine wave and Noise Figure.
11. Study and perform experiment based on Pulse Modulation and Demodulation techniques (PAM, PWM and PPM).

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO06/EI3CO06	Digital Signal Processing	3	1	2	5

Unit-I Orthogonal transforms: Properties and applications of DFT, implementing linear time invariant systems using DFT, circular convolution, linear convolution using DFT; two dimensional DFT,FFT algorithms: Decimation in time, decimation in frequency; Goertzel algorithm,Chirp Z, DCT.

Unit-II Digital Filter design techniques: Design of digital IIR filters: Impulse invariant, and bilinear transformation techniques for Butterworth and Chebyshev filters; Design of FIR filters: linear phase in FIR filters, Windowing(Rectangular, Bartlett, Hann, Hamming etc), frequency sampling filter design, optimum. approximations of FIR filters.

Unit-III Implementation of digital filters : Direct form-I, Direct form-II, Cascade form and Parallel form structures for FIR and IIR filters. Lattice and Lattice-Ladder Structures. Telligen's theorem for digital filters and its applications.Quantization, round-off and over flow errors in Digital Filters.

Unit-IV Discrete Random Signals: Random variables, statistical averages , corelation, covariance, central limit theorem, Discrete time random process ,response of linear system to random signals, power spectral density of random process, bandpass random processes, optimum filtering.

Unit-V DSP Processor: Features and architectures of DSP processor, Fixed point processor, Floating point processor, applications of DSP processor, Introduction to Texas instrument series TMS320C67XX(13 and 48).

Text Books:

1. A.V.Oppenheim and R. W. Schafer, Digital Signal Processing, Prentice Hall.
2. L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall.
3. J.G. Proakis, and D.G. Manolakis, Digital Signal Processing, PHI.

Reference Books

1 Andreas Antoniou, Digital Filters, Analysis, Design and Applications, McGraw Hill.
2 S. K. Mitra, Digital Signal Processing: A computer based approach, Tata McGraw Hill.

List of Practicals

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.

6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT-Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc)

Note: Above mentioned experiments are required to be performed on MATLAB environment as well as on DSP Processor Kit (TMS320C6713).

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO08	Engineering Electromagnetics	4	0	0	4

Unit-I Co-ordinate Geometry and Vector calculus

Co-ordinate systems and Co-ordinate geometry, Line, Surface and Volume integrals,curl, divergence and gradient, Divergence theorem and Stokes' theorem. Laplacian for scalar and vectors. Vector identities.

Unit-II Electrostatics

Coulomb's law, Field due to different charge distributions, electric flux density, dielectric constant, Gauss's law and its applications, Potential difference and potential, Potential field of a point charge and different charge distributions, Potential gradient, Dipole, Capacitance between two isolated conductors, Boundary conditions at discontinuities between two media including conducting boundaries, Energy density in electrostatic field, Poisson's and Laplace equation, solution of Laplace equation, Ohm's Law and Continuity of current.

Unit-III Magnetostatics

Biot-Savart's law, magnetic field intensity, magnetic flux density, permeability, Ampere's circuital law, applications of Ampere's law, solenoid and toroid, point form of Ampere's circuital law, vector magnetic potential, magnetization, Magnetic boundary conditions, Magnetic circuit, Self inductance and Mutual inductance.

Unit-IV Time Varying Fields and Maxwell's Equations

Lorentz force equation, Force on a moving charge, Faraday's law, Displacement current, modified Ampere's law, Maxwell's equations in point and integral forms for time varying fields, Maxwell's equation for time harmonic field, wave equations in source free region, solution to wave equation, Intrinsic impedance, Poynting theorem, complex Poynting vector. Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, Skin Depth.

Unit-V Polarization and uniform plane waves

Linear, circular and elliptic polarization, Reflection of uniform plane waves, Plane waves at normal incidence and at oblique incidence, Standing wave ratio, Brewster Angle, total internal reflection, transmission line analogy.

Text Books:

1. Matthew Sadiku, Elements of Electromagnetics ,Oxford University Press.
2. E.C. Jordan & K.G. Balmian: Electromagnetic wave and Radiating System, PHI.
3. S.P. Seth , Elements of Electromagnetic Fields, Dhanpat Rai Publication

Reference Books:

1. William H. Hayt, Engineering Electromagnetic, TMH
2. John D. Kraus, Electromagnetics. Mc. Graw Hill.
3. Joseph Edminister, Electromagnetics -Schaum's Outline Series, TMH

Web Sources

1. https://www.youtube.com/watch?v=pGdr9WLto4A&list=PLI6m4jcR_DbOx6s2toprJQx1MORqPa9rG&spfreload=10
2. https://www.youtube.com/watch?v=EiX3R6lkDDU&list=PLBZrb0wA6HTd9CclN_Ku_I065MXbHZh6U&index=2&spfreload=10

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO10	Microprocessor & Microcontrollers	3	0	2	4

UNIT I BASICS OF MICROPROCESSOR SYSTEM

Evolution of microprocessor, internal architecture and pin diagram of 8085 microprocessor, operations of microprocessor, address de-multiplexing in microprocessor, addressing modes, memory and concept of memory/IO device interfacing, timing diagram of memory read, memory write cycle, definitions of Machine cycle, instruction cycle and T state.

UNIT II 8086 MICPROCESSOR

Internal architecture and pin diagram of 8086 microprocessor, segmentation of memory, minimum mode and maximum mode operation, addressing modes and instruction set of 8086, assembler directives, assembly language programming, and interrupt of 8086.

UNIT III INTERFACING OF DEVICES WITH 8086

Memory interfacing, interfacing of 8255 PPI, 8253/54 Programmable Counter/ Timer, 8257 DMA controller, USART 8251 and 8259A Programmable Interrupt controller.

UNIT IV 8051 MICROCONTROLLER

Difference between microcontroller and microprocessor, internal architecture and pin diagram of 8051 microcontroller, memory organization, Timer/counter and interrupt , addressing modes, instruction set of 8051 , and applications of microcontroller.

UNIT V HIGH END PROCESSSORS & MICROCONTROLLER

Concepts of RISC & CISC, Von Neumann and Harvard Architecture, Salient features of miroprocessors 80286, 80386, 80486, and Pentium, Introduction to ARM processors (ARM 7,9,11), ARM Programmer's Model.

Text Books:

1. R.S. Goankar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing.
2. A.K. Ray and K. M. Bhurchandi, Advanced Microprocessoprs and Peripherals-Architecture , Programming and Interfacing ,Tata McGraw-Hill
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded System, Pearson Education.

Reference Books

1. Steve Furber, ARM system-on-chip architecture, Addison Wesley Publication.
2. Hall Douglas V, Microprocessor and Interfacing, McGraw-Hill Education (India) Pvt Limited.
3. Kenneth J. Ayala, The 8051 Microcontroller Architecture the III Edition- Cengage Learning.
4. Eben Upton, Raspberry Pi – User Guide, John Wiley & Sons Publication.

Web Sources:

1. https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf

List of Practicals

1. Assembly Language Programs based on 8086 microprocessor.
2. I/O devices interfacing with 8086/8051 (microprocessor/microcontroller) using Peripheral ICs.
3. Hands-on with Raspberry Pi kit.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3MC04	Human Values & Ethics	2	0	0	**0**

Unit I: HUMAN VALUES

Introduction

Important Human Values: Trust, Honesty, forms of Dishonesty, Courage, Integrity, Kindness, Humility, Gratitude, Hope, Perseverance, Empathy and Compassion.

Values in Engineering Profession: Safety, Risk, Accidents, Human progress; Clean, Clear, Decision Making; Community, Partnership with Nature. Commitment and Cooperation.

Unit II : ETHICS AND ETHICAL THEORIES

Morality and moral systems, Introduction to Ethics, Consequentiality and Non-consequentiality theories, Hedonism, Utilitarianism, Deontological theories , Ethical Rules (with reference to W D Ross), Situation Ethics, Virtue Ethics

Unit III: ETHICS IN ENGINEERING PROFESSION

Introduction, Historical context of ethics, Definition of Profession, Engineering and Professionalism, Professional Ethics, Engineering Ethics, Role and Responsibilities of Engineers, Working towards Safety, Sample Code of Ethics for Engineers, National Society of Professional Engineers (NSPE).

Practicing ethics as an engineering student: Plagiarism & Cheating, Academic Dishonesty and Cheating v/s Teamwork.

Unit IV: DECISIONS MAKING

Decision Making, Characteristics of Decision Making, Advantages of Decision Making, Steps Involved in Decision Making Process.

Unit V: ETHICS IN THE INDIAN TRADITION AND SOME CASE STUDIES.

Contribution of Moral Thinkers: Indian Moral Thinker, Western Moral Thinker.

Case studies on human values and engineering ethics.

Case studies on decision making in engineering ethics.

Text Book:

1. Simon Blackburn, The Oxford dictionary of philosophy. Oxford University Press.
2. Anthony Weston, A 21st Century Ethical Toolbox. Oxford University Press.
3. John Hospers, An introduction to philosophical analysis. Allied Publishers Private Limited.

References:

1. W.K Frankena, Ethics. Prentice Hall of India.
2. John Hospers, An Introduction to Philosophical Analysis. Allie Publishers.
3. LaFollette Hugh, Ethics in Practice: An Anthology. Cambridge, Blackwell.

Web Sources

1. http://ethics.sandiego.edu/
2. http://www.bbc.co.uk/ethics/introduction/
3. http://plato.stanford.edu/

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EI3CO04	Communication System	4	0	0	4

UNIT-I: Introduction:
Communication system, Basic blocks in a communication system: transmitter, channel and receiver; Characteristics and modeling of communication channel; baseband and pass band signals and their representations; concept of modulation and demodulation, need of modulation.

UNIT-II: Continuous wave (CW) modulation
Continuous wave (CW) modulation: AM, DSB/SC, SSB, VSB, methods of generation; Demodulation techniques of CW modulation: coherent and non-coherent; Nonlinear modulation techniques: FM and PM, narrowband FM, wideband FM, methods of generation; FM spectrum; Demodulation techniques for FM; Frequency Division Multiplexing (FDM); Radio transmitters and receivers.

UNIT-III: Noise in Analog Communication System:
Noise in Analog Communication System: Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and quadrature phase components and its Properties, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.
Performance of analog modulation schemes in AWGN :SNR, post-demodulation SNR and figure of merit for various modulation schemes, threshold effect in FM, pre-emphasis and de-emphasis in FM, FMFB. Noise in receivers; Noise figures;

UNIT -IV: Pulse Modulation schemes:
Sampling process, pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) ; pulse code modulation (PCM); quantization error, nonlinear quantizer A-law , Mu- law , line coding; differential pulse code modulation; delta modulation and adaptive delta modulation, Basics of time division multiplexing, noise consideration in PAM and PCM systems.

UNIT -V: Digital Modulation Schemes:
Overview of geometric representation of signals, Gram-Schmidt Orthogonalization procedure; Basic digital modulations schemes: Phase shift keying (PSK), amplitude shift keying (ASK), frequency shift keying (FSK) and Quadrature amplitude modulation (QAM); coherent demodulation and detection; probability of error. Basics of equivalent complex baseband representation of digitally modulated signals

Text Books:

1. Simon Haykins, Communication System, John Willy
2. H. Taub & D. Schilling, Principles of Communication Systems, TMH,
3. R.P. Singh & S.D. Sapre, Communication System, TMH

Reference Books:

1. B.P.Lathi, Modern Digital & Analog Communication System, TMH
2. J.G. Proakis, M. Salehi, Fundamentals of Communication Systems, Pearson Edu.
3. L. Couch, Modern Communication System, Pearson

List of Practical:-

1. Measure the value of unknown using Maxwell Bridge.
2. Measure the value of unknown using Hays Bridge.
3. Measure the value of unknown using Schering Bridge.
4. Measure the value of unknown using Wien Bridge.
5. Study of CRO demonstration kit.
6. Measure Unknown frequency using Lissajous patterns in CRO.
7. Demonstrate features of digital storage oscilloscope.
8. Measurement of Capacitance and self inductance using Q meter.
9. Design and analyze the behavior of a 4-bit D/A converter.
10. To design and build a simple Analog-to-Digital (ADC) using Op-Amp circuits and resistors.

Note: Syllabus for Fundamentals of Management, Economics and Accountancy EM3HS04 is same as AU.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EI3CO08	Electronics Instrumentation and Measurement	3	1	2	5

UNIT I:

Instrumentation System and standards of measurement: Introduction, Block diagram, functional elements of measurement system, Accuracy, Precision, sensitivity, Resolution, Introduction to static and Dynamic Characteristics, Error: definition, classification, statistical analysis of errors, Remedies for Errors. Loading effect.

UNIT II:

Bridge Measurement and Basic Parameters measuring instruments:

DC bridges- Wheatstone bridge, Kelvin's double bridge, AC bridges – Hays, Maxwell, Schering and Wien bridges, Wagner ground Connection, Q Meter.

Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, AC Voltmeter, True- RMS responding Voltmeter, Electronic multi-meter

UNIT III:

Oscilloscope and Digital display devices: Construction and working of CRO, deflection, triggering & synchronization, Time, Phase and Frequency measurement. Storage CRO, Sampling CRO, Digital Oscilloscope. Digital display system and indicators, Classification of Displays, Display devices: Light Emitting diodes (LED) and Liquid Crystal Display (LCD).

UNIT IV:

Test and measuring instruments: Signal Generator, Function Generator, sweep frequency generator, Pulse and square wave generator, Digital IC tester, Logic Analyzer and Wave Analyzers, Harmonic Distortion Analyzer, Spectrum Analyzer, Frequency counter.

UNIT V:

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC.

Analog-to-digital Conversion(ADC)-Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, , Digital Voltmeter and multimeter, Resolution and sensitivity of digital meter,

Text book:

1. A. D. Cooper, Modern Electronics Instrumentation, PHI.
2. A.K.Sawhney, Electrical and electronic Measurement
3. H.S. Kalsi, Electronic Instrumentation– TMH

References:

1. David Bell: Electronic Instrumentation and Measurement, oxford press.
2. B.G. Liptak, Process measurement and analysis.
3. B.C Nakra, K.K. Cahudhary Instrumentation Measurement and Analysis by, Tata Mc Graw Hill.